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10/588,668	08/30/2006	Josuke Nakata	F-9186	9961

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EXAMINER	
GARDNER, SHANNON M	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/588,668	NAKATA, JOSUKE	
	Examiner	Art Unit	
	Shannon Gardner	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/8/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 5 is objected to because of the following informalities: line 3 of the claim requires "by means of sail plural lead wires". It appears that Applicant intended the claim to require "by means of *said* plural lead wires" and the claim will be treated as such for the purposes of this action. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 6 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 recites the limitation "said planar light receiving module" in line 4 of the claim. Claim 6 draws dependency from *either* claim 1 *or* claim 2 (as defined in claim 4) and claim 1 does not include the limitation of a planar light receiving module. Therefore, there is insufficient antecedent basis for this limitation in the claim. For the purposes of this action, claim 6 is reviewed as though it depends from claim 2 (through claim 4).

Claim 8 recites the limitation "said planar light receiving module" in line 1 of the claim. Claim 8 draws dependency from *either* claim 1 *or* claim 2 (as defined in claim 4) and claim 1 does not include the limitation of a planar light receiving module. Therefore, there is insufficient antecedent basis for this limitation in the claim. For the purposes of this action, claim 8 is reviewed as though it depends from claim 2 (through claim 4).

Claim Rejections - 35 USC § 103

4. Claim 1 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Simmons (US 5720827, cited in IDS).

As to claim 1, Simmons is directed to a laminated solar battery (Figure 2) wherein plural solar cell modules (22, 26, 28, 30, 32) are incorporated and integrally laminated (24; column 7, lines 18-21), characterized by that:

- There are provided with plural types of solar cell modules (22, 26, 28, 30, 32) having different sensitivity wavelength bands with are so laminated that the shorter the center wavelength in the sensitivity wavelength band is, the more near the module is located to an incidental side of sunlight (top) (column 6, lines 50-59),
- Wherein at least one type of the solar cell module is constructed to be a cell group module having plural nearly spherical solar cells (22, 26, 28, 30, 32) aligned in plural columns and plural rows (see Figure 2 for configuration).

The Examiner notes that the nearly spherical solar cells of Simmons are viewed as being aligned in plural rows (horizontal) and plural columns (vertical) on a single plane as viewed in Figure 2.

If it is not taken that Simmons teaches the solar cells being aligned in plural columns then it alternatively would have been obvious to one of ordinary skill in the art at the time of the invention that the cells are aligned to be in plural columns of a desired width (not necessarily corresponding to the size of *one* solar cell).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons (US 5720827, cited in IDS) as applied to claim 1 above, and further in view of Freundlich et al. (US 6150604).

Regarding claim 2, Applicant is directed above for a full discussion of Simmons as applied to claim 1. Simmons teaches that it is desirable to create a solar cell with a high efficiency photo-absorptive region to increase the efficiency of the cell (column 2, lines 14-17 and 35-37). This is achieved by absorbing a variety of wavelengths of light as well as attempting to absorb the majority of light passing through the cell. But, Simmons is silent as to at least one type of the solar cell module is constituted with a planar light receiving module having a planar common pn junction.

However, it is known in the prior art to provide a planar light receiving module having a planar common pn junction (12/16) and a reflective mirrored surface (10) in a solar module to absorb wavelengths of light and reflect back unabsorbed light to increase efficiency as taught by Freundlich et al. (Figure 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to supply a planar light receiving module having a planar common pn junction as taught by Freundlich at the bottom of the solar cell of Simmons in order to ensure that the light not captured by the spherical solar cells of Simmons will then be captured by the bottom solar cell increasing the overall efficiency of the solar device.

Regarding claim 3, modified Simmons teaches four types of solar cell modules, three types of solar cell modules among the four types of solar cell modules being constituted with cell group modules each of which is comprising plural nearly spherical solar cells aligned in plural columns and plural rows (Simmons; Figure 2, 22, 26, 28), and one type of solar cell module among the four types of solar cell modules being constituted with a planar light receiving module having a planar common pn junction (Freundlich; Figure 1).

8. Claims 4-8, 10-11, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons (US 5720827, cited in IDS) in view of Freundlich et al. (US 6150604) as applied to claim 2 above, and further in view of Nakata (WO 2004/001858, US 2006/00086384 relied upon as English equivalent, references are made to US 2006/00086384).

Regarding claims 4 and 5, Applicant is directed above for a full discussion Simmons in view of Freundlich as applied to claim 2. Modified Simmons teaches the solar cells being aligned in plural columns and plural rows (see Simmons; Figure 2) with a planar light receiving module having a planar common pn junction (Freundlich; Figure 1) but is silent as to the plural columns and plural rows in the cell group modules being electrically connected in serial and parallel via plural lead wires extending in a columnar direction or a row direction and led to the outside.

However, it is known in the solar cell art to connect spherical solar cells aligned in plural columns and plural rows via plural lead wires (4a, 4b) extending in a columnar direction as taught by Nakata as to achieve series or parallel electrical connection (abstract and Figure 6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to electrically connect the spherical solar cells of Simmons with plural lead wires extending in a columnar direction to achieve series or parallel electrical connection as taught by Nakata.

Regarding claim 6, the references teach a serial connection circuit for electrically connecting the plural types of solar cell modules (Nakata; abstract) but are silent as to specifically maintaining the output current of each of the cell group modules to be nearly equal to an output current of the planar light receiving module.

However, maintaining the electrical output of the spherical cell modules by controlling the number of spherical cells in a module would have been within purview of one of ordinary skill in the art. It is known in the prior art to achieve a desired electrical

output of a solar cell module by altering the number and/or size of the solar cells in the module and therefore by routine experimentation the skilled artisan would have matched the output current of each of the cell group modules to be nearly equal to an output current of the planar light receiving module to prevent shorting of the device and maximize efficiency.

Regarding claim 7, modified Simmons teaches the cell group modules having two layers of plural spherical solar cells aligned in plural columns and plural rows (see Simmons; Figure 2), arranging the spherical solar cells in the two layers to approach one another without overlapping in a plane view (see Figure 2 for configuration).

Applicant is reminded that claim 7 includes open language and therefore, though Simmons has more than 2 layers, this configuration is not precluded by the current claim language. Further, the spherical solar cells of Simmons do not overlap in a plane view.

Regarding claim 8, Simmons in view of Freundlich teaches the planar light receiving module (Freundlich; 12/16 in Figure 1) being arranged in the lowest layer to be located downside of the plural cell group members (Simmons; Figure 2), and there is provided with a reflective member (Freundlich, 10) capable of reflecting the sunlight downside of the planar light receiving module.

The Examiner notes that the planar light receiving module and mirrored surface of Freundlich is utilized in Simmons to capture any light not received by the spherical solar cells thereby increasing the efficiency of the device. Therefore, it would have

been obvious to one of ordinary skill in the art to provide this planar module downside of the spherical solar cells.

Regarding claim 10, modified Simmons teaches the plural solar cells (22, 26, 28, 30, 32) being received in a buried state inside transparent glass (24) in the cell group modules (see Simmons; column 7, lines 12-21 and claim 3).

Regarding claim 11, modified Simmons teaches the limitations of claim 7 but do not specifically teach a transparent member made of transparent glass being fixed at a top of the solar cell module on the incident most side in the incidental direction of sunlight. The Examiner notes that Simmons does show the incident-most side of the cell module is transparent glass (24) but it is not provided as a separate transparent member.

However, it is known in the prior art to provide a protective film on at least one surface of the covering material, as taught by Nakata (paragraph [0022]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a protective glass film on at least one surface of the covering material of the modified device of Simmons as taught by Nakata.

Regarding claim 16, modified Simmons teaches plural cell group modules being incorporated above a planar light receiving module. The references do not explicitly teach two types of planar light receiving modules wherein one or more plural cell group modules are incorporated between the two types of planar light receiving modules.

However, it is known in the prior art to provide a protective film on at least one surface of the covering material, as taught by Nakata (paragraph [0022]) which is capable of receiving light.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a protective glass film on at least one surface of the covering material of the modified device of Simmons as taught by Nakata by which the protective glass film receives light from the incident source.Regarding claim 17, modified Simmons teaches the laminated solar battery according to claim 1. Nakata teaches forming plural types of solar cell modules in the shape of a cylinder and then laminated in the shape of a concentric cylinder (Figure 26) to achieve light absorption over a wider incident angle range.

9. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons (US 5720827, cited in IDS) in view of Freundlich et al. (US 6150604) as applied to claim 2 above, and Nakata (WO 2004/001858, US 2006/00086384 relied upon as English equivalent, references are made to US 2006/00086384) as applied to claim 7 above, and further in view of Alvi et al. (*The Potential for Increasing the Efficiency of Photovoltaic Systems by Using Multiple Cell Concepts*, cited in IDS).

Regarding claim 9, Applicant is directed above for a full discussion of the references as applied to claim 7. Freundlich teaches a mirror film on either the backside of the cell or in-situ between active layers (column 3, lines 39-44) but is silent as to the mirror film reflecting a light of sensitivity wavelength bands that can easily be absorbed by solar cell modules above any solar cell module.

However, it is known in the solar cell art to utilize "selective mirrors" to divide the solar spectrum into energy bands that selected cells can respond to as taught by Alvi as a means of improving cell efficiency.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include the selective mirrors of Alvi in the modified device of Simmons to provide the best cell efficiency possible.

10. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons (US 5720827, cited in IDS) in view of Freundlich et al. (US 6150604) as applied to claim 3 above, and further in view of Alvi et al. (*The Potential for Increasing the Efficiency of Photovoltaic Systems by Using Multiple Cell Concepts*, cited in IDS) and Alivisatos et al. (US 20030226498).

Regarding claims 12 and 13, Simmons in view of Freundlich teaches the planar light receiving module being arranged in the lowest position below the multiple cell group modules (The Examiner notes that the planar light receiving module and mirrored surface of Freundlich is utilized in Simmons to capture any light not received by the spherical solar cells thereby increasing the efficiency of the device. Therefore, it would have been obvious to one of ordinary skill in the art to provide this planar module downside of the spherical solar cells), and the three types of cell group modules (Simmons; 22, 26, 28, 30, 32) having the first to third cell group modules laminated sequentially from an incidental side of sunlight.

Alvi teaches the use of 2 or 3 different bandgap material cells ordered in optical series within a single cell module to increase the efficiency of a device (Summary). Alvi

further teaches the use of silicon, gallium arsenide and gallium phosphide type materials (pp 953 and 956).

Alivisatos et al. teaches the use of spherical semiconductor nanocrystals in solar cells (abstract and paragraph [0065]) in a binder material (paragraph [0070]). The reference further teaches the use of tandem cells utilizing GaAs, GaP, GaAs, Ge and Si (paragraphs [0003] and [0065]).

One of ordinary skill in the art at the time of the invention would have found it obvious to utilize GaP, GaAs and Si together in a tandem solar cell (as taught by Alivisatos) optically ordered from shortest to longest wavelength absorption (as taught by Alvi) from an incident side wherein the planar light receiving module has a planar common pn junction formed in an InGaAs semiconductor layer which is formed on an n-type InP semiconductor substrate (as taught by Freundlich; Figure 1).

11. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons (US 5720827, cited in IDS) in view of Freundlich et al. (US 6150604) as applied to claim 3 above, and further in view of Alvi et al. (*The Potential for Increasing the Efficiency of Photovoltaic Systems by Using Multiple Cell Concepts*, cited in IDS) and Alivisatos et al. (US 20030226498) and Wegleiter et al. (US 6531405).

Regarding claims 14 and 15, Simmons in view of Freundlich teaches the planar light receiving module being arranged adjacent to the multiple cell group modules. The three types of cell group modules (Simmons; 22, 26, 28, 30, 32) having the first to third cell group modules laminated sequentially from an incidental side of sunlight. Placing the planar light receiving module in a top layer above the plural cell group modules

would have been obvious to one of ordinary skill in the art by simple rearrangement of parts (MPEP § 2144.04 C).

Alvi teaches the use of 2 or 3 different bandgap material cells ordered in optical series within a single cell module to increase the efficiency of a device (Summary). Alvi further teaches the use of silicon, gallium arsenide and gallium phosphide type materials (pp 953 and 956).

Alivisatos et al. teaches the use of spherical semiconductor nanocrystals in solar cells (abstract and paragraph [0065]) in a binder material (paragraph [0070]). The reference further teaches the use of tandem cells utilizing GaAs, GaP, GaAs, Ge and Si (paragraphs [0003] and [0065]).

Wegleiter et al. teaches the use of a GaAsP semiconductor layer on a GaP substrate in a planar solar device (column 1, lines 32-36).

One of ordinary skill in the art at the time of the invention would have found it obvious to utilize GaP, GaAs and Si together in a tandem solar cell (as taught by Alivisatos) optically ordered from shortest to longest wavelength absorption (as taught by Alvi) from an incident side wherein the planar light receiving module has a planar common pn junction formed in an GaAsP semiconductor layer which is formed on an n-type GaP semiconductor substrate (as taught by Wegleiter et al.; column 1, lines 32-36).

Contact/Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shannon Gardner whose telephone number is

(571)270-5270. The examiner can normally be reached on Monday to Thursday, 5am-3pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571.272.1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. G./
Examiner, Art Unit 1795

/Alexa D. Neckel/

Supervisory Patent Examiner, Art Unit 1795